GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

Precautions to be taken during Construction of New buildings

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Preface

Earlier in Indian Railways, there were no comprehensive Guidelines or instructions regarding precautions to be taken during Construction of New Buildings. In all the contracts for Building and Road works, the IRUS Specifications are adopted as the basic document and Additional Specifications are included for specialised items of works which are voluminous in their contents. Thus this report is essentially meant as a handy ready reference document for use in the field by concerned SSEs / JEs. This report shall bridge the gap & provide technical information on guideline & precautions to be taken during construction activities on Indian Railways like Earthwork, Foundation work, Concrete work, Masonry work, Roofing, waterproofing, drainage works & finishing works etc.
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1. **Earthwork**

1.1. **General precaution:** -

1. Excavating shall not be carried out below foundation level of adjacent buildings, until underpinning, shoring, etc, is done.

2. Adequate precautions shall be taken to see that the excavation operations do not affect adjacent buildings.

3. Trenches and foundation pits shall be securely fenced and posted with proper precautionary signs. They shall be marked with red lights at night to avoid accidents.

4. Arrangement shall be made for protection / diversion of service installations like water supply lines, sewer lines, power cables etc., situated within excavation area.

5. Permanent bench mark shall be drawn from standard bench mark erected at site. Ensure that whether the bench mark coordinated with interrelated agencies like PWD, Railways, NHAI etc.

6. Ensure that profiles made on ground to indicate the correct formation level at different level.

7. Ensure that permission has been obtained from the concerned authorities for felling of trees.

8. Ensure that permission of concerned authorities have been taken where Archeological Monuments exist in / near the work site.

1.2 **Jungle Clearance/ Felling Trees:**

1. Ensure that all operations involved including uprooting of vegetations, clearance of grass etc., as provided for in the contract execute.

2. Ensure that serviceable materials stacked properly and in-serviceable materials cleared from site to facilitate disposal.

1.3 **Excavation in all kind of soil:**

1. Ensure that all excavated material is being disposed off as provided for in the contract.
2. Ensure that natural drainage of the area is being maintained during excavation.
3. Ensure that excavation done to true levels, slope, shape and pattern as instructed by the Engineer or as indicated in the drawings.
4. Ensure that the bed of excavation for foundations and for other locations water and rammed as directed by the Engineer.
5. Ensure that excavated earth dumped at locations where un-necessary re-handling of earth is not required.

1.4 **Shoring or timbering:**

1. Ensure that slopes of sides of trenches are being maintained with or without shoring as instructed by the Engineer.
2. All trenches exceeding 2.0 m in depth shall be securely shored and timbered as determined by the Engineer-in-charge.

1.5 **Form Work**

1. Use steel shuttering. In case of timber /plywood shuttering, permission of Engineer In-charge is required. Ensure that joints are neat and if possible tongued & grooved.
2. Use oil on the face concreting face of shuttering.
3. Ensure that arrangements made for protecting the adjacent structures, from damages due to excavation below their foundation level by way of underpinning, shoring etc. if applicable.
4. Ensure that permission has been obtained from the concerned authorities for felling of trees.
5. Ensure that natural drainage of the area is being maintained during excavation.
6. Ensure that before pouring lean concrete leveling course in foundation the excavated base checked by walking, for loose spots.
7. Don’t allow rickety formwork or yielding supports.
8. Don’t remove formwork until concrete has attained adequate strength.
1.6 Anti termite treatment (CHEMICAL TREATMENT): All the chemicals are poisonous and hazardous to health. These chemicals can have an adverse affect upon health when absorbed through the skin, inhaled as vapours or spray mists or swallowed. Persons handling or using these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely sources of accidental poisoning. They should be cautioned to observe carefully the safety precautions given below:

1. Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water specially before eating. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash into the eyes they shall be flushed with plenty of soap and water and immediate medical attention should be sought.

2. Ensure that specified quantity of chemical is used for the required area and being executed by specialized agency.

1.7 Foundation

1. Ensure that gauge sieve of correct sizes are actually used for measuring aggregate size.

2. Ensure that sand and aggregate conform to the grading specified.

3. Ensure that mandatory tests have been carried out for checking quality of water, cement, aggregate, sand and coarse aggregate quality found satisfactory as specified in Unified Standard Schedule of Rates otherwise IS specification.

4. Ensure that curing of concrete is done for specified number of days using proper methodology.

5. Ensure that where foundations are stepped, the overlap is more than the thickness of concrete layer.

6. Ensure that proper storage arrangement for water, cement, aggregate, sand and coarse aggregates.
7. Ensure that the principle of “First in, first out” followed in issuing cement for use in the works.

8. Ensure that machine mixing is done for at least 2 minutes after adding water.

9. Ensure that vibrators of appropriate type available for compaction of concrete.

10. Ensure that compaction completed before start of initial setting of Cement.

11. Ensure that for concrete exposed to severe sulphate attack, suitable lining or surface coating given to prevent access by sulphate solution.

12. Ensure that curing done as specified in IS Code or for a minimum period of 7 days/10 days in case of ordinary Portland cement for normal/ dry & Hot weather, and 10 days /14 days in case of blended cement or cement mixed with mineral admixture for normal/ dry & hot weather conditions.

2. CONCRETE WORKS
   1. Ensure that mandatory tests have been carried out for checking of quality of ingredients of concrete.
   2. Ensure that manufacturer’s test certificate on quality of cement and admixture available to confirm their satisfying requirements as per specifications laid down.
   3. Ensure that regular sources for supply of materials of required grades/ sizes identified including standby sources.
   4. Ensure that the principle of “First in, first out” followed in drawing cement for use the works.
   5. Ensure that concrete is of consistency / slump as specified. Ensure that concrete cubes are made and tested as specified.
   6. Ensure that concrete is placed, and compacted before initial set.
   7. Insist on machine mixing in proper proportion as per design mix. Use only potable water in concreting.
   8. In batching concrete, the quantity of both cement and aggregate shall be determined by weight except where volumetric batching is permitted by the Engineer.
9. Ensure that shuttering is strong enough to withstand the dead and live loads, forces caused by ramming and vibration of concrete and other incidental loads imposed upon it during and after casting of concrete. Ensure that surface has been coated with suitable mould oil.

10. Use suitable vibrators for all RCC work and pavement slabs and other important works.

11. Ensure that rate of concreting in vertical direction restricted to maximum 1 metre per hour.

12. Ensure that vertical drop of concrete while placing is not more than 1.5 metres at a time. If drop is more than 1.5 metre then chute shall be used for concreting.

13. Avoid concreting when temperature falls below 4.5\(^\circ\) C and temperature of wet concrete goes over 38\(^\circ\) C.

14. Ensure that no layer takes final set before the layer above is placed and compaction of every layer is completed within 30 minutes of addition of water to the dry mixture.

15. Ensure that exposed surface of RCC works rendered smooth with cement mortar 1:3 of thickness not exceeding 6mm after roughening the surface.

16. Don’t fail to take and record slump and other field tests.

17. Don’t allow concreting unless you have been satisfied regarding positioning of reinforcement, cover spacers, soundness of formwork and all aspects of quality control.

18. Don’t allow excessive vibration.

19. Don’t allow over-trowelling/floating.

20. Don’t expose fresh concrete to scorching sun, rain or frost.

3. COMMON REQUIREMENTS FOR REINFORCED CEMENT CONCRETE

1. Ensure that manufacture’s test certificate on quality of steel available to confirm it satisfying the requirements as per specifications laid down.

2. Ensure that correct spacers for cover are maintained to ensure uniform concrete cover.
3. Ensure that mandatory test have been carried out for checking quality of steel for reinforcement and quality found to be satisfactory before starting concreting.

4. Check that cranking is at correct positions.

5. Check that the laps are dimensionally correct and are staggered.

6. Ensure that welding is carried out as per norms, where this is specified.

7. Don’t allow rusty reinforcement.

8. Don’t allow laps at location of maximum bending moment.

9. Don’t use too many small lengths of TMT reinforcement bars.

3.1 Form Work (Centering & Shuttering): Ensure that form work designed to satisfy the following requirements-

1. Ensure that formwork is strong enough to withstand the dead and live loads, forces caused by ramming and vibration of concrete and other incidental loads imposed upon it during and after casting of concrete.

2. Suitable arrangements to make up any settlement in the form work either before or during the placing of concrete.

3. Ensure that removable in sections in the desired sequence without damaging the surface of concrete or other sections and without any piece keyed into concrete.

4. Ensure that form work and concreting of upper floor taken up only after concrete of lower floor has set for atleast 14 days.

5. Ensure that shuttering is of sufficient stiffness to avoid excessive deflection and joints are tightly butted to avoid leakage of slurry.

6. Ensure that arrangement of form work for walls provides for the wall faces kept at fixed distance apart with spacer tubes or bolts.

7. Ensure that shuttering surface has been coated with suitable mould oil.

8. Ensure that shuttering has a smooth and even surface.

9. Check the completed formwork for levels.
3.2 Reinforcement:
1. Ensure that steel proposed for use is free from loose mill scale, dust, loose rust, coats of paint/oil/other materials which may destroy or reduce bond strength.
2. Ensure that anchorage length of bars provided in tension/compression is as specified for development length as per IS 456-2000.
3. Ensure that welding permitted in lieu of overlap have done as per IS 2751 and IS 941.
4. Ensure that steel test certificate checked before used.
5. Ensure that overlaps are staggered and of proper length.
6. Ensure that steel got tested from a recognized laboratory, if provision is made in contract.
7. Ensure that blocks are of adequate ratio of cement and coarse sand, strength, thickness and evenness to ensure the availability of cover for protection of steel reinforcement against corrosion.

4. Brickwork and Block work:

4.1 Use of Mortar: The mortar used should have adequate workability. Mortar shall be used as soon as possible after mixing and before it begins to set, and in any case within half hour, after the water is added to the dry mixture.

1. Ensure that mandatory tests have been carried out for checking quality of water, cement, aggregate & coarse sand quality found satisfactory.
2. Check the manufacturing month of cement and ensure that quality of cement is satisfactory. Also ensure the manufacture’s test certificate.
3. Ensure that proper storage arrangement for the storage of water, cement, aggregate and sand.
4. Ensure that grade of masonry mortar required for the work has been decided along with the cement mortar or cement lime mortar.
5. Ensure that mixing of mortar done properly to achieve necessary working consistency.
4.2. Brick Work:

1. Bricks should be soaked in water for adequate period so that the water penetrates to its full thickness. Normally 6 to 8 hours of wetting is sufficient.
2. A systematic bond must be maintained throughout the brickwork. Vertical joints shouldn’t be continuous but staggered.
3. The joint thickness shouldn’t exceed 1 cm. It should be thoroughly filled with the cement mortar 1:4 to 1:6 (Cement: Sand)
4. All bricks should be placed on their bed with frogs on top (depression on top of the brick for providing bond with mortar).
5. Thread, plumb bob and spirit level should be used for alignment, verticality and horizontality of construction.
6. Ensure that joints are fully filled with mortar leaving no voids. Joints should be raked and properly finished with trowel or float, to provide good bond.
7. A maximum of one metre wall height should be constructed in a day.
8. Brickwork should be properly cured for at least 10 days.
9. Ensure that brickwork is protected from rains while under construction.
10. Ensure that rectangular or square buildings, while setting, the diagonals checked to ensure accuracy. To avoid horizontal crack near slab and brickwork joint 6mm plaster with cement punning should be done at top surface of brick work before casting of slab.

4.3. Stonework:

1. Stones should have homogenous structure. They should be strong, hard, and tough, close grained and should be of uniform texture. The size of these stones should be as large as possible to minimize the number of joints. Stones should be free from defects, flows, soft patches, cavities and cracks.
2. The stones should be well seasoned and washed clean before they are used. They should be dressed well as per the requirement.
3. Stones should be well watered before using in the construction so that they do not absorb moisture from the mortar instantaneously. Immediate
withdrawal of water from the mortar affects the hardening process of mortar and renders it to be weak.

4. The mortar used should have adequate workability.

5. Stones should be laid on their natural bed and the joints completely filled with mortar so that there is no cavity.

6. Proper bond should be maintained throughout the work. Continuous vertical joints should always be avoided.

7. Stone masonry is least resistant to tensile stresses, hence it should be ensured that no tensile stresses are allowed to develop anywhere in the masonry.

8. The face and back of the stone wall should be well bonded together by using bond stones at frequent intervals. Bond stones should be laid in staggered fashion in successive courses with a maximum internal distance of 1.50 meters. The whole masonry work should be raised uniformly so that no unequal loading occurs in foundation.

9. Quoins used at corners and at door and windows should be of full height of the course.

10. Length and breadth of stones used at quoins should be at least twice or 1 ½ times their depth.

11. Too small size stones should not be used in the masonry.

12. All the cavities in the masonry must be filled up with spalls and mortar mixture. All the exposed joints should be raked to a depth of 25mm and pointing should be done with rich cement mortar.

13. The entire masonry should be cured for at least 10 days.

14. The scaffolding used in stone masonry construction should be strong enough to bear the load. Double scaffolding is most suitable one since no holes need to be left in the masonry for putlogs.

15. The bed joints should be uniform and should be thoroughly filled up. Stones should have level surfaces at bottom so that no hollow is left in the bed joints.
Hollow addressed bed joints may lead to cracks in the stone under loaded condition.

16. Hard stones without flaws should be used as bed blocks below the beams.

17. Before constructing new stone masonry work over old one, the old stone masonry should be cleaned with wire brushes and watered sufficiently. Chases for dowels, clamps etc. should be made prior to starting of work. Suitable lifting devices should be used to lift large sized stones.

5  DOORS AND WINDOWS (WOOD AND METAL)

5.1  Timber doors, windows and ventilators

a) Door Frames-

1. Frames shall be installed at the required place.

2. Each door frame shall be provided with three holdfasts on either side-on at the top, one at the top & bottom (30 cm away from the top and bottom edge) and one in the middle.

3. As far as possible, masonry or concrete in the wall shall be built after installation of the door frames so that holdfasts and pins at the bottom are well anchored into them.

4. Before construction of masonry, the outside of the frames coming in contact with masonry shall be given a thick coat of coal tar or other water proofing paint.

5. Suitable arrangements shall be made to hold the frames in rectangular shape during construction. Usually one cross batten at the middle and one cross batten at the bottom (where no sill is provided for the door) and two cross battens diagonally will be necessary to hold the frame rectangular.
b) **Window Frames**

1. Window frames shall also be installed in the same manner as door frames except that at least two holdfasts shall be provided on either side to anchor them in position.

2. The size of the opening shall first be checked and cleaned including the place of the holdfasts of all obstructions.

3. The position of the unit in the reveal shall be taken off the drawings and a vertical chalk line shall be marked on the reveal at the jambs, using a plumb line at the correct distance from the face of the wall. The chalk line shall also be run along the head and sill of the opening.

4. **Fixing Datum**- To ensure that all units are set at the appropriate heights in their openings, the datum line for the sill of the door, window or ventilator shall be taken from a fixed point on the wall or from finishes floor or ceiling with the help of a level. This datum level shall be given by the builder to the fixer.

5. Precaution shall be taken to fix the door frame so as to take care of the final floor level and also the following points:
   a) Whether the shutters are inside the opening or outside the opening; and
   b) Whether the frames are for exterior use or interior use and in the case of latter direction and position of water carriers, slopes, etc.

5.2 **Fixing of door/ window/ ventilator shutter**

1. The size of the shutters shall be checked before installation. Usually adjustments will be possible by planning the sides, top and bottom to the extent of 6 mm.

2. The door shutters shall be adjusted and fixed with two screws on each hinge (blank fitting) before the polishing of the terrazzo and similar type of floorings is taken up. Such shutters shall then be removed the terrazzo flooring polished and the shutters re-fixed in position with all screws.

3. During installation the shutters shall be carefully lifted, carried and fixed. Dragging of shutters particularly decorative shutters one over the other or on ground is likely to scratch and damage the surfaces.
4. Any special instruction by the door and window manufacturers regarding the position of hinges, aldrops and locks shall be noted and complied with during installation.

5. Any transit defects or storage defects in a shutter should be rectified. Any crack should be filled up with a good putty. Any damaged surface veneer particularly in decorative shutter may be rectified by inserting a matching veneer and use of suitable glue and pressing by use of ‘C’ clamps or other suitable device. Any corner-opening may be rectified by the use of glue and pressing by ‘C’ clamps. Any damage to moulding or glazing bars or other fixtures shall be done at site by use of similar material.

6. Unless otherwise specified, door shutters shall be fixed to the frames with 100 mm long hinges and width to suit the thickness of the door and using suitable wood-screws.

7. The hinges shall be fixed one at the centre and the other two at 25 cm each from the top and bottom of the shutter. In the case of window shutters each shutter shall be fixed to its frame. With 80 mm hinges at suitable places preferably at quarter height from up and down. When driving the screws it is advisable that in case of hard timbers pilot holes are drilled before fixing the screw. The screw shall be driven tight fit and straight.

8. The ventilator shutters shall be fixed with two hinges per shutter on sides or at top as required and with the same precautions as for fixing window shutters.

9. Checking after Fixing-The door and window shutters shall be checked again after fixing for proper location, alignment and swinging. Any rectification necessary shall be done.

10. Installation of Fixtures -The shutters shall then be fixed with locks, tower bolts, handles and other fixtures like floor stoppers and aldrops as required. The manufacturer’s instructions for fixing these hardware shall be followed. The shutters may also, if required, shall be fixed with name plates, vision panels, louvres, etc.
11. After all the fixtures have been fitted the shutter shall be tried for proper closure, handling and movement and shall then be prepared for painting or finishing.

12. Fixing of Glazed Panels - Glass panels, where desired should be fixed taking precautions that correct type and correct size of glass panels and glass fixtures are used. The opening at the edges shall be filled up with glass fixing putty or beading.

13. Installation of Composite Doors, Windows and Ventilators- Where combination of doors, windows and ventilators is desired, care shall be taken that the symmetry of the combination both as to the dimension, colour and fixture is preserved.

14. Flush doors for bath room shall preferably be avoided. However, when flush doors are used in such situations, PVC doors or suitable water protection at bottom of the flush door shall be provided with 15 cm to 60cm high plate of aluminium or plastic.

15. Special fixtures for doors where provided shall be according to the drawing or specifications of the builder.

6 STEEL CONSTRUCTION (Metal doors, windows and ventilators)

1. Care shall be taken that steel doors and windows etc. are not deformed/damaged during subsequent constructions.

2. All fittings and hinges (projecting hinges) shall be protected, preferably with alkathene sheets so that these may not be damaged during execution of work.

3. In particularly aggressive conditions such as humid coastal environments, aluminum door, window with powder coated paint should be used.

7 FLOORS AND FLOOR COVERINGS

1. Ensure that sub base is properly compacted.
2. Ensure that base is cleaned of dirt, loose particles, mortar droppings and laitance by scrubbing with steel wire brush.

3. Ensure that in flooring on roof terrace and balconies, whether, glass strips are not provided to avoid seepage to the lower floor from joints.

4. Ensure that floor in verandah, courtyard, balcony, kitchen, bath etc. have been provided with proper slope towards drains.

7.1 Brick floors

1. Ensure that Bricks arranged are to the dimensions and designations stipulated.

2. Ensure that mortar used is as per specifications.

3. Ensure that base concrete provided with required slope for proper drainage.

4. Ensure that Bricks to be laid in mortar soaked in water for atleast 6 hours.

5. Ensure that bricks laid on edge on 12mm thick mortar bed with inside faces of bricks buttered with mortar and vertical joints filled with mortar.

6. Ensure that thickness of joints restricted to 10mm.

7.2 Cement concrete floors

1. Before constructing the flooring, levelling should be done and marking should be done on wall at 30 cm above from required level. For this purpose spirit level or mercury level should be used. For better accuracy, water level used by mason (mistry), should not be used. Due to more length of pipe and friction inside the pipe, results are not accurate. One should use long wooden patty while making floors so that floor surface can be flat.

2. Flooring in lavatories and bath room shall be laid only after fixing of water closets and squatting pans and floor traps. Traps shall be plugged while laying the floors and opened after the floors are cured and cleaned. Any damage done to WCs, squatting pans and floor traps during the execution of work shall be made good.
3. During cold weather, concreting shall not be done when the temperature falls below 4\(^\circ\)C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone.

4. During hot weather, precautions shall be taken to see that the temperature of the wet concrete does not exceed 38\(^\circ\)C.

5. Plastering of all inside walls and ceilings, fixing of door frames and other heavy work shall be completed before laying the floors.


7. Ensure that curing is done for the specified period.

8. Follow other instructions under ‘Concrete Works’ (mentioned earlier).

9. Ensure that base concrete provided with required slope for proper drainage.

10. Ensure that base is of lean Cement Concrete, whether top of surface roughened, wetted and given a coat of cement slurry at 2kg cement per sqm.

11. Ensure that border panel width restricted to 45 cm, if provided.

12. Ensure that panels are of uniform size of area not exceeding 2 sqm and no side exceeding 2m in length.

13. Ensure that edges of sunk floor finished and rounded off with Cement Mortar 1:2 and finished with a coat of neat cement.

14. Ensure that curing done for a minimum period of 10 days.

15. Ensure that glass / other strips have been fixed at proper levels.

16. Ensure that floors of W.C., bath, kitchen and balcony depressed by 10 to 15mm.

17. Don’t allow trowelling / floating after concrete is set.

18. Don’t allow workmen to walk over fresh concrete already laid.

### 7.3 Cement Concrete Flooring with Topping of Red Oxide

1. Ensure that base concrete laid stipulated.

2. Ensure that top layer is of Cement Plaster 1:3 of minimum thickness 10mm with a floating coat of neat Cement, all laid within 24 hours after laying of underlayer.
3. Ensure that Cement plaster layer and in neat cement layer, 3.5 Kgs of red oxide mixed with 50 kgs of Cement.
4. Ensure that top cement slurry is with 2 kg of cement red oxide mix per sqm of flooring.
5. Ensure that top surface brought to a fine polish by use of polishing stones.
6. Ensure that junction of floor with all plastering, dado or skirting rounded off upto 25mm radius.
7. Ensure that curing done for a period of 10 days minimum after the top layer has hardened, avoiding use of wet empty cement gunny bags which may disfigure the surface.

7.4 Cement Concrete Flooring with Metallics Hardner Topping (Hardonite Flooring)

1. Ensure that base concrete laid as stipulated.
2. Ensure that under layer of cement concrete provided as stipulated.
3. Ensure that top layer laid with 12mm thick mix 1:2 (1 Cement: 2 Stone aggregate 6mm nominal size by weight) with metallic hardener 1 part per 4 parts of cement.
4. Ensure that top layers laid within 24 hours of laying of under layer and top layer finished smooth and true to slope after initial set has started.

7.5 Cement Plaster in Risers of Steps, Skirting & Dado

1. Ensure that the cement plaster is done to required thickness.
2. Ensure that in the masonry walls, joints raked to a depth of at least 15mm and in concrete wall surface hacked and cleaned with water.
3. Ensure that surface of skirting finished with a layer of cement slurry at 2 Kgs of cement per litre of water spread over 1 sqm.
4. Ensure that skirting is flush with plaster, whether a groove 10mm wide and up to 5mm deep provided at junctions of skirting with plaster.
7.6 **Cement Plaster Skirting Finishing with Red Oxide of Iron**

1. Ensure that under-coat of Cement Plaster provided except that surface is finished rough with a scratching tool.
2. Ensure that top coat provided with cement plaster 1:3 and finished with floating coat of cement at 1.0 kg per sqm of surface.
3. Ensure that whether top coat of plaster and floating coat, 3.5 Kgs of red oxide per 50 Kgs of cement mixed and done on the next day after application of undercoat.
4. Ensure that surface finished to a fine polish by use of polishing stone after surface has hardened.
5. Ensure that curing done for minimum 7 days starting on the next day after plastering.

7.7 **Cement Concrete pavement in courtyard, terrace etc.**

1. Ensure that base concrete and concrete pavement layer provided.
2. Ensure that dimension of panel restricted to 1.25m and area to 1.25 sqm for panels upto 50mm thickness.
3. Ensure that concreting done in alternate panels only.
4. Ensure that surface beaten with trowel and surface allowed to dry by itself or by mopping excess water.
5. Ensure that surface finished rough with wooden floats or chequered uniformly if so specified.

7.8 **Terrazo/ Marble Chips / Flooring laid in situ**

1. Ensure that under layer Cement Concrete provided over CC/RCC base after application of Cement Slurry @ 2.00 kgs per sqm of area.
2. Ensure that under layer is in panels of uniform size not exceeding 2.0 sqm. In area or 2m length in inside situations and with length of any side restricted to 1.25m in exposed situations.
3. Ensure that strips of required height provided for taking Terrazo layer with strips 2mm thick in case of PVC/Aluminum/Brass, 4mm in case of glass and 5mm in case of plain asbestos sheet.

4. Ensure that Terrazo mix for top layer consist of Cement, pigment, marble power, marble chips and water as specified in CPWD specifications.

5. Ensure that dry mixture of mortar stored in a dry place protected from moisture.

6. Ensure that Terrazo topping laid while the under layer is still plastic but has hardened sufficiently.

7. Ensure that Cement slurry of the same colour as topping brushed on the surface before laying of Terrazo topping and the Topping laid to uniform thickness slightly more than the specified thickness.

8. Ensure that flooring in lavatories and bathrooms laid after fixing of water closets, squatting pans and floor traps.

9. Ensure that traps covered when the grinding is in process.

10. Ensure that workmanship-polish, smoothness, lines and levels.

7.9 Crazy Marble Flooring

1. Ensure that base cement concrete surface roughened with steel wire brushes and base RC slab surface hacked and overlaid with a floating coat of cement slurry at 2 kg of cement per sqm to take the under layer.

2. Ensure that under layer is of cement concrete 1:2:4 of thickness of 25mm.

3. Ensure that top layer is made up of mix of white cement with or without pigments, marble powder, marble chips, marble stone pieces and water in the proportion and size as specified in CPWD specification.

4. Ensure that top surface of under layer coated with cement slurry at 2 kg of cement per sqm of area, marble stone pieces set by hand, interstices filled by cement marble chips mixtures and top trowelled over.

5. Ensure that flooring in lavatories and bathrooms laid after fixing of water closets, squatting pans and floor traps.
7.10 Terrazo Tile Flooring

1. Ensure that tiles are ISI marked or of approved make/manufacturer.
2. Ensure that supplied with initial grinding and grouting of wearing layer.
3. Ensure that the size of tiles are as specified with tolerance in length and
   breadth of ± 1mm and in thickness of ± 5mm. Whether range of dimensions in
   any one delivery does not exceed 1mm in length and breadth and 3mm in
   thickness.
4. Ensure that bedding layer provided of cement mortar 1:4 (coarse sand) with
   average thickness 30mm and minimum thickness 10mm.
5. Ensure that tiles set to a true surface on neat grey cement slurry of honey like
   consistency at the rate of 4.4 kgs per sqm. With joints not exceeding 1.5mm in
   thickness.
6. Ensure that tiles tested for water absorption, wet transverse strength and
   abrasion.
7. Ensure that required part size tiles are cut by sawing and not by breaking tiles.
8. Ensure that tiles laid adjoining the un-plastered walls or entered at least 12mm
   under the plaster skirting or dado.

7.11 Terrazzo Tiles in risers of steps, skirting and dado

1. Ensure that bedding the tiles, 12mm thick cement plaster 1:3 provided with
   hardened plaster roughened with wire brushes, backside of tiles buttered with a
   coat of grey cement slurry and edges with grey or white cement slurry with or
   without pigment and tiles laid in position.
2. Ensure that the risers of step, skirting or dado resting on the top of tread or
   flooring.

7.12 Chequered Tiles flooring

Ensure that the chequered tiles are cement tiles or terrazzo tiles (as specified)
and are of dimensions as specified with centre to centre distance of chequers
not less than 2.5cms and not more than 5cms, overall thickness not less than 22mm and depth of groove not less than 3mm.

7.13 Chequered Tiles in stair threads

1. Ensure that tiles are to dimensions as specified.
2. Ensure that The RCC or Brickwork on which the tiles are to be laid cleaned, wetted and mopped.
3. Ensure that bedding tiles, 10mm thick cement plaster 1:4 provided and neat grey cement slurry (4.4 kgs of cement in sqm) spread and tiles laid.
4. Ensure that square end of tile butt against unpolished face of concrete or brick tread or embedded under the side wall plaster, skirting or dado and under the riser tile or other finish to a depth of not less than 10mm.

7.14 Glazed Tile flooring

1. Ensure that tiles are of approved make/manufacture or ISI marked.
2. Ensure that tiles of dimensions as specified with tolerance in average length / breadth & tolerance of individual length / breadth not exceeding as specified in IR specification.
3. Ensure that edges are glazed whether glazing restricted to 50% of edge area.
4. Ensure that base Cement Concrete or RCC slab cleaned, wetted and mopped.
5. Ensure that bedding Cement mortar of proportion 1:3 provided for 10mm average thickness with minimum of 5mm thickness and allowed to harden.
6. Ensure that neat grey cement slurry of 3.3 kg of cement per sqm area spread on mortar bedding and tiles laid on it duly cleaning off surplus slurry.
7. Ensure that the tiles fixed in floor adjoining the wall enter for minimum 10mm under the plaster, skirting or dado.
8. Ensure that joints cleaned to a depth of 2mm to 3mm and flush pointed with white cement and pigment, if required to match the colour of tiles.
9. Ensure that curing done for minimum 7 days.
10. Ensure that finished floor not sounding hollow when tapped with a wooden mallet.

7.15 Glazed Tiles in skirting and dado:

1. Ensure that the tiles satisfy the warpage requirement for tiles of various sizes as described in IR Specifications.
2. Ensure that the tiles satisfy BIS requirement on water absorption, crazing, impact resistance and chemical resistance as conformed by Manufacture’s test certificates.
3. Ensure that joints in masonry raked to a depth of 15mm and in case of concrete walls, surface, hacked, washed and wetted.
4. Ensure that time lag between under layer and tile laying did not exceed 24 hours.
5. Ensure that base cement mortar 1:3 provided for 12mm thickness, allowed to harden and wetted glazed tiles laid after coating backside with cement slurry liberally.
6. Ensure that skirting / dado rest on top of flooring.
7. Ensure that chamfered tiles used at projecting corners.

7.17 Ceramic / Vitrified tiles:

1. Ensure that base concrete or the RCC slab on which the tiles are to be laid is cleaned, wetted and mopped.
2. Ensure that bedding for tiles are with cement mortar 1:4 (1 Cement: 4 Coarse Sand) or as specified.
3. Ensure that average thickness of the bedding is 20mm while the thickness under any portion of tiles should not be less than 10mm.
4. Ensure that cement slurry of honey like consistency is being spread at the rate of 3.3 Kg of cement/sq. metre over bedding.
5. Ensure that before placing, tiles are being soaked in water, washed clean. Each tile is being gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles.

6. Ensure that surface of the flooring is being checked frequently during laying with a straight edge about 2 m long, so as to obtain a true surface with the required slope.

7. Tiles which are fixed in the floor adjoining the wall shall enter not less than 10mm under the plaster, skirting or dado.

7.18 Marble Flooring

1. Ensure that marble type, colour, size and thickness is approved by Engineer-in-charge and meet tolerance in thickness, length and breadth as specified.

2. Ensure that bedding Cement mortar layer 1:4 below slab is of average thickness 20mm and minimum thickness 12mm.

3. Ensure that washed slab laid on mortar bed, tapped and brought to level with adjoining slab, slab lifted out, hollow spaces filled with mortar, mortar allowed to harden, Cement slurry @ 4.4 kgs of cement per sqm spread on mortar, edges of previously laid slab buttered with grey or white cement with or without pigment to match the shade of marble slabs and slab laid.

4. Ensure that excess mortar cleaned off and flooring cured for a minimum period of 7 days.

5. Ensure that slabs which are fixed to the floor adjoining the walls, extend for minimum 12mm under the plaster, skirting or dado.

6. Ensure that laying the slabs whether care has been taken to match the grains of adjoining slabs.

7. Ensure that all carpentry and painting works, except final coat of paint, have been completed before the final grinding.
7.19 Kota Stone Flooring

1. Ensure that stone is of quality specified, hard, sound, dense and homogeneous in texture, free from cracks, decay, weathering and flaws.

2. Ensure that the stones are of size as specified with tolerance of ±2mm in thickness and tolerance of ±5mm for hand cut slabs and ±2mm for machine cut slabs in respect of length and breadth.

3. Ensure that top exposed face of slab pre-polished, sides fine chisel dressed to full depth and table rubbed or machine rubbed before use in paving.

4. Ensure that 12mm thick plaster of cement mortar 1:3 mix or as specified applied and allowed to harden. The plaster shall be roughened with wire brushes or by scratching diagonal at close intervals.

7.20 Red or White rough dressed sand stone Flooring

1. Ensure that the stone slabs are hard, sound, durable, tough and free from cracks, decay and weathering and of thickness 40mm with a tolerance of ±2mm.

2. Ensure that the slabs rough chisel dressed on top with maximum unevenness of 6mm and sides chisel dressed to a depth of minimum 20mm with maximum unevenness of 30mm and with sides dressed beyond this depth splayed to form inverted V shape.

3. Ensure that base concrete cleaned, wetted and mopped and whether bedding cement mortar is of 1:5 (coarse sand) of average thickness 20mm and minimum thickness below slabs of 12mm.

4. Ensure that mortar spread under washed slabs and slabs laid and pressed to fill up hollow spaces below. Whether joint thickness restricted to 5mm and surface of slabs cleaned of surplus mortar.

5. Ensure that pointing with other mortar mix is specified, whether joints raked to a minimum depth of 12mm, pointing done when the mortar is green and cured for minimum 7 days.
6. Ensure that slabs which are fixed in the floor adjoining the wall laid entering not less than 12mm under the plaster, skirting or dado.

7.21 PVC Sheet/ Tiles Flooring

1. Ensure that PVC Sheets/ Tiles are ISI marked or of approved make.
2. Ensure that PVC flooring material is of specified size and thickness and with permitted tolerance of \( \pm 0.15 \text{mm} \) in thickness and \( \pm 0.1\% \) in dimensions of sheets and rolls.
3. Ensure that suitable adhesive, rubber based or PVC based, identified depending on the surface and location in which to be used.
4. Ensure that sub floor is thoroughly dry and damp proof and period of 4 to 8 weeks lapsed for drying sub floor.
5. Ensure that PVC flooring is to be laid in AC rooms, whether temperature maintained between \( 20^0 \text{C} \) and \( 30^0 \text{C} \) for at least 7 days, during the laying and for 48 hours thereafter.
6. Ensure that at least 24 hours allowed for developing proper bond of the adhesive, before use of PVC flooring.
7. Ensure that exposed edges of PVC sheets / Tiles in doorways and stair treads protected from damage by Metallic edge strips.

7.22 Linoleum Flooring

1. Ensure that Linoleum is ISI marked or of approved make.
2. Ensure that the base on which Linoleum is to be laid is thoroughly dry and damp proof.
3. Ensure that Linoleum left at a temperature of not less than \( 20^0 \text{C} \) for at least 48 hours before unrolling.
4. Ensure that Linoleum unrolled and loose laid out flat for 2 to 3 days before it is cut to size.
5. Ensure that adhesive brushed over the base and sheets pressed down and rolled with 70 kg CI roller leaving no air packets below.
6. After laying, whether edges of adjacent sheets butt against each other without any gap and adhesive contaminating the face of the sheets removed with kerosene oil or spirit.

7.23 Rubber Flooring

1. Ensure that Rubber tiles are of type, dimensions and thickness as specified ISI marked or of approved make.
2. Ensure that the base on which the tiles are to be laid is smooth, thoroughly clean and dry and waterproof.
3. Ensure that adhesive has been applied to the base and to the back and edges of tiles and tiles pressed and smoothened down with suitable tool to remove air pockets below.
4. Ensure that butt joints are very fine with no adhesive sticking to the face of tiles.

7.24 Wooden Flooring

1. Ensure that timber used is thoroughly seasoned and treated with preservative.
2. Ensure that supporting beams and joints provided as shown in drawings with minimum width of joints of 50mm.
3. Ensure that the length of boards is restricted to 3 metres supported on at least 3 points.
4. Ensure that Boards are of width not less than 100mm and not more than 150mm.
5. Ensure that longitudinal joints of boards are tongued and grooved to a minimum depth of 12mm and heading joints are of square butt type occurring over the centre line of supporting joints.
6. Ensure that iron screws are of slotted countersunk head type, of length not less than thickness of planks plus 25mm.
7. Ensure that junction between timber flooring and adjacent flooring protected by a metal strip.
8. Ensure that the surface is finished with bee waxing or by any other method specified.
9. Check seasoning, quality and species of timbers before these are used.
10. Check that joints conform to specifications.
11. See that hardwood or bamboo pins are used in securing joints where specified.
12. See that correct white lead has been applied in joints where specified.

7.25 Cast Iron Grid Tiles Flooring

1. Ensure that Cast Iron Tiles are to the dimensions specified and as per the drawings with top surface ground smooth and sides of the hollows left in rough cast state.
2. Ensure that bedding layer provided of 1:2 Cement Concrete (1 Cement: 2 Stone aggregate 6mm nominal size) for 12mm thickness, tamped and correct to levels.
3. Ensure that Tiles laid on bed concrete and tapped for concrete to rise into the hollows by about 3mm.
4. Ensure that the hollows filled immediately with 1:2 CC and tamped and finished 6mm below the top with the joints between adjacent tiles being not more than 3mm.
5. Ensure that the top 6mm of the hollows grouted with neat cement slurry and surface cleaned of all mortar dropping.
6. Ensure that tiles fixed adjacent to the wall, enters for at least 12mm under the plaster, skirting or dado.
7. Ensure that surface left wet for a period of at least 7 days.

8 WALL AND CEILING FINISHES AND COVERINGS AND WALLING

8.1 Wall and ceiling finishes and coverings

8.1.1 Plastering:
1. Ensure that the joints is raked out properly. Dust and loose mortar brushed out. Efflorescence, if any, has been removed by brushing and scrapping. The surface has been thoroughly washed with water, cleaned and kept wet before plastering is commenced.

2. Ceiling plaster, if required, shall be completed before commencement of wall plaster.

3. To prevent surface cracks appearing between junctions of column/beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go.

4. The average thickness of plaster shall not be less than the specified thickness, (here 12mm). The minimum thickness over any portion of the surface shall not be less than the specified thickness by more than 3mm.

5. Curing shall be started 24 hrs. after finishing the plaster. Ensure that curing started after plaster has hardened and kept wet for minimum 7 days.

8.1.2 Washed Stone Grit Plaster

1. Ensure that the concrete surface pock-marked not less than 3mm deep with pointed tool at spacing of about 5 cms, mortar washed off, cleaned and surface wetted.

2. Ensure that stone chippings are of 10mm nominal size, free of dust and deleterious material.

3. Ensure that mortar is of mix as stipulated for undercoat and for top coat with stone chips.

4. Ensure that for 12mm undercoat made of Cement Mortar 1:4, finished with a wooden float and roughened with a scratching tool with furrowing about 2mm deep and scratch lines not more than 10cm apart.

5. Ensure that for 15mm Top Coat applied a day or two after the undercoat has taken initial set.
6. Ensure that for 15mm Top Coat mortar is of proportion 1:0.5:2 with 1 Cement, 0.5 Coarse sand and 2 Stone chippings.
7. Ensure that 15mm Top Coat undercoat coated with cement slurry of 2 kgs cement /sqm of area before application of top coat.
8. Ensure that top coat is finished to a true and plumb surface as tested with 2.5m long straight edge and plumb bobs.
9. Ensure that corners, angles and junctions are truly horizontal or vertical.
10. Ensure that finished surfaces of top coat after taking initial set, scrubbed and washed with water till the stone chippings are sufficiently exposed.
11. Ensure that curing started 24 hours after finishing the plaster and kept wet for minimum of 7 days. Whether date of plastering marked legibly to facilitate curing as required.

8.1.3 Rough cast Plaster:
1. Ensure that joints raked out, loose materials removed, surface cleaned and wetted.
2. Ensure that mortar of mix is being mixed as per specifications.
3. Ensure that under layer of Cement Mortar is of 12mm thickness and allowed to take initial set but kept wet.
4. Ensure that the top layer of Cement Mortar 1:3 in plastic stage, of 10mm thickness laid after a day or two after adding 10% of finely ground hydrated lime by weight of cement.
5. Ensure that the rough cast mixture / pebble dash mixture of sand or gravel or crushed stone / pebbles wetted and dashed on the cement mortar layer while in plastic state.
6. Ensure that the surface represents homogeneous surface.

8.1.4 Neat Cement punning:
Ensure that surface covered with a paste of neat cement and rubbed smooth with a trowel, in no case later than half an hour of adding water to the plaster mix.
8.1.5 Pointing on brickwork:

1. The joints shall be raked out properly. The joints shall be raked to such a depth that the minimum depth of the new mortar measured from either the sunk surface of the finished pointing or from the edge of the brick shall not be less than 12mm.
2. For new work, where pointing is to be done, the raking of joints shall be done during the progress of work, when the mortar is still green.
3. Ensure that mortar of specified mix is being used.
4. While pointing old work, the joints should be made sufficiently wet before pointing as the mortar will not stick to a dry surface.
5. The type of mortar as well as pointing should be judiciously chosen depending upon the requirement of job.
6. No pointing work should be carried out during the frost weather as it will result in dis-integration of joints due to freezing.
7. The joints of pointed work (whether vertical, horizontal or slant) should be clearly de-pitched in pointing work by regular lines of uniform width. In case of slant joints (as in random rubble masonry), the joints line should meet at or near the junctions.

9 ROOFS AND ROOFING

9.1 Corrugated Galvanized Steel (CGS) Sheet roofing

1. Ensure that the CGS Sheets are ISI marked and conform to IS 277 with 750 Grade of Zinc coating as confirmed by the Manufacturer’s Test certificate.
2. Ensure that the sheets are free from cracks, split, twists, surface flaws etc. with galvanizing in perfect condition.
3. Ensure that sheet does not show signs of rust or white powdery deposits on the surface.
4. Ensure that corrugations are uniform in depth and pitch and parallel with sides.
5. Ensure that the pitch of roof is not flatter than 1 vertical to 5 horizontal.
6. Ensure that the sheets laid with a minimum lap of 15 cms at the ends depending on slope of roof and 2 ridges of corrugations on each side. For flatter slopes the minimum permissible end lap shall be 20 cm.
7. Ensure that the minimum lap of sheets with ridge, hip and valley is 20 cm measured at right angles to the line of ridge etc.
8. Ensure that Lap area pre-painted with one coat of steel primer and two coats of approved paints.
9. Ensure that sheets fixed to the purlins / rafters with galvanized J or L Hook bolts and nuts 8mm dia with bitumen and GI Limpet washer or as specified.

9.2 Non Asbestos Cement Corrugated sheet roofing

1. Ensure that sheets are ISI marked or as per IS 14871 as confirmed by the manufacturer’s test certificate.
2. Ensure that sheets are free from cracks, chipped edges or corners and other damages.
3. Ensure that pitch of roof is not flatter than 1 vertical to 5 horizontal.
4. Ensure that sheets laid with the smooth side upwards.
5. Ensure that maximum spacing of purlins under the sheets are 1.40m in the case of 6mm thick sheets and this shall in no case be exceeded.
6. Ensure that the sheets laid with a side overlap of half a corrugation and an end lap of 15 cm minimum in the case of roofs with a pitch flatter than 1 vertical to 2.5 horizontal and in the case of very exposed situations, the minimum permissible end lap is 20 cms.
7. Ensure that free over-hand of the sheets at eaves restricted to 30 cm.

10 Painting, Polishing and Varnishing:

Protective measures: Surfaces of doors, windows, floors, articles of furniture, etc, and such other parts of building not to be whitewashed or colour washed,
shall be protected from being splashed upon. Such surfaces shall be cleaned of whitewash or colour wash splashes, if any.

10.1 Whitewashing with Lime/ Whiting

1. Ensure that new surface thoroughly brushed free from mortar dropping and foreign matter.
2. Ensure that mix prepared as described as specifications.
3. Ensure that white washing done with stroke of brush.
4. Ensure that each coat allowed to dry before doing next coat.
5. Ensure that finished surface is with no sign of cracking and peeling and not coming off readily on the hand when rubbed.
6. Ensure that white washing on ceiling done prior to that on the wall.
7. Ensure that doors, window etc. protected from splashes and whether splashing and droppings, if any removed.

10.2 Colour washing

1. Ensure that colour wash of shade as required made by adding mineral colour not affected by lime to lime wash.
2. Ensure that for new works whether two or more coats of colour wash applied over the priming coat of white wash with lime or whiting.
3. Ensure that finished dry surface is free from cracks not powdery and not come off on hand when rubbed.
4. Ensure that splashes and droppings removed.
5. Ensure that sufficient quantity of colour wash is made for the complete job in one operation.

10.3 Dry Distemper

1. Ensure that Dry Distemper is of required colour (IS 427) and of approved brand and manufacture.
2. Ensure that distemper mixed with clean water of quantity recommended by manufacturer and allowed to stand for atleast 30 minutes before use.

3. Ensure that new surface thoroughly brushed and sand papered smooth and new plastered surface allowed to dry for atleast two months.

4. Ensure that two or more coats over priming coat given for new works as per specification.

5. Ensure that distemper brushes used for brushing done by horizontal strokes followed by vertical strokes.

6. Ensure that subsequent coat given only after previous coat is dry.

7. Ensure that finished surface is uniform, showing no brush marks.

10.4 Oil Emulsion (Oil Bound) Washable Distempering

1. Ensure that oil emulsion (oil bound) washable distemper to IS 428 is of approved brand and manufacture.

2. Ensure that Cement primer or distemper primer arranged for new works from the same manufacture of oil emulsion distemper.

3. Ensure that new surface dusted clean, washed and scrubbed clean, unevenness of entire surface made good by plaster of paris mixed with water, allowed to dry for 48 hours and sand papered smooth.

4. Ensure that whether priming coat of distemper primer or cement primer applied depending on whether the wall surface is fully dry or not.

5. Ensure that where distempering is proposed within 6 months of completion of wall plaster, whether one coat of alkali resisting priming paint conforming to IS 109 applied and allowed to dry.

6. Ensure that whether priming coat allowed to dry for atleast 48 hours, surface sand papered and distemper coating given using distempering brushes with horizontal and vertical strokes. Whether minimum 24 hours allowed between two successive coats.
10.5 Cement paint / Whether Coat Paint

1. Ensure that Cement paint is confirming to IS 5410. The same shall be is of approved brand.
2. Ensure that whether surface is thoroughly cleaned of foreign matter by brushing and washing and pitting in plaster made good and a coat of waterproof cement paint applied on wet patches.
3. Ensure that mix of Cement paint/ Whether Coat Paint and water made as per manufacturer’s instructions.
4. Ensure that solution is being applied as per manufacturer’s instructions.
5. Ensure that each coat applied after a gap of at least 24 hours without wetting the surface.
6. Ensure that water proof cement paint is not applied on surface already treated with white wash, colour wash, distemper dry or oil bound, varnish, paint etc or on gypsum, wood or metal surface.

10.6 Painting Priming Coat on Wood, Iron or Plastered surfaces

1. Ensure that Primer is confirming to specifications or specified in the contract.
2. Ensure that the Primer is of ready mixed type of approved brand and manufacture.
3. Ensure that for wooden surface, whether surface sand papered, knots dealt with by filler material, primer applied and the holes and indentations stopped with putty.
4. Ensure that for Iron and Steel surface, whether rust and scales removed.
5. Ensure that for plastered surface, whether holes and undulations filled up by plaster of paris /putty and rubbed smooth.
6. Ensure that the surface is dry before priming coat is applied.
7. Ensure that for steel members in aggressive environment, whether second coat of red oxide zinc chromate primer applied.
10.7 Painting with Ready Mixed paint

1. Ensure that Ready mix paint is of approved brand and manufacture.
2. Ensure that for wood work, whether surface sand papered, knots dealt with by filler covered by red lead, holes filled by putty and surface rubbed smooth.
3. Ensure that for Iron and Steel work, whether priming coat dried completely and rust and scaling removed by scraping or brushing by steel wire.
4. Ensure that for plastered surface, whether the priming coat dried completely and all dust and dirt removed by wiping the areas.
5. Ensure that old wood work, whether the old paint is sound, whether surface rubbed down with pumice stone, washed with lime, rinsed with water and dried, followed by washing with soap and water. Where the old paint is flaked badly, whether old paint removed completely and holes filled with putty.
6. Ensure that for old iron and steel work, where the old paint is sound, whether surface rubbed with wire brushes, loosened paint removed, surface wiped with mineral turpentine and allowed to dry. Where the old paint is flaked, whether the old paint removed completely and priming coat given.
7. Ensure that for old plastered surface, whether procedure as for wood work adopted and damp patches treated by a coat of white lead.

10.8 Painting with Ready Mix paint over Galvanized sheets

1. Ensure that Ready mix paint is of approved brand and manufacture.
2. Ensure that a Priming coat of red oxide zinc chromate or as stipulated given before fixing sheet in place.
3. Ensure that new sheets have weathered for about a year and if not whether they have been coated by a mordant solution as specifications. Whether rust patches cleaned with emery paper and brush, surface washed and dried and rusted area given a coat of red lead.
4. Ensure that paint in old sheets is in good condition, whether cleaned of grease etc, surface rubbed down with sand paper and rusty patches given a coat of red lead.

5. Ensure that paint in old sheets is flaked whether the paint completely removed.

6. Ensure that the crowns of corrugations painted first and after they dry, entire surface painted.

7. Ensure that the crowns of corrugations painted first and after they dry, entire surface painted.

8. Ensure that the subsequent coat applied after previous coat has dried.

10.9 Painting Cast Iron Rain Water, Soil, Waste and Vent pipes and fitting

1. Ensure that primer of approved brand and manufacture is being applied.

2. Ensure that paint is anti corrosive bitumastic paint or as specified and the same processes follow as 11.2 above.

3. Ensure that no. of coats are being painted as specified in the description of item.

10.10 Painting with Wood Preservative (Creosote Oil)

1. Ensure that oil type wood preservative is of specified quality and approved make.

2. Ensure that surface is perfectly, sand papered and dust etc removed.

3. Ensure that painting done with brush and not by means of rags etc.

4. Ensure that at least 24 hours time allowed between painting of successive coats.

10.11 Coal Tarring

1. Ensure that Coal tar is of approved manufacture conforming to IS 290 to which unslaked lime and kerosene oil added at the rate as Specification.

2. Ensure that surface cleaned of all dust, rust etc and painting done with brush.
3. Ensure that adequate quantity of coal tar used in painting and each coat taken up only the earlier coat has thoroughly dried up.

10.12 Spray Painting with Wall Paint

1. Ensure that primer and wall paint are of approved brand and manufacture and of the required shade.
2. Ensure that on new walls, whether distemper primer applied if wall is over 12 months old and cement primer if wall is less than 12 months old.
3. Ensure that wall paint applied on dry surface by spray painting of uniform and even layers with each coat allowed to dry overnight and lightly rubbed with sand paper and brushed off before application of next coat.
4. Ensure that adequate ventilation provided to disperse spray fumes with fitments and floor protected from the spray.

10.13 Wall Painting with Plastic Emulsion Paint

1. Ensure that Paint is confirming to IS: 5411 and of approved brand and manufacture and required shade.
2. Ensure that water is being used for thinning the emulsion not turpentine.
3. Ensure that new surface thoroughly cleaned and dusted off and made free from rust, dirt and mortar droppings etc.
4. Ensure that on old surface, whether rubbed down with pumice stone to get a flat surface, washed with lime, rinsed with water, dried, loose paint etc removed and again washed with soap and water.
5. Ensure that each coat has been allowed to dry for 1 to 3 hours as required before taking up next coat.
6. Ensure that the finished surface presents a velvety smooth finish.
7. Ensure that old brushes are to be used, whether cleaned with normal/warm water.
8. Ensure that brushes during break period /after use are kept immersed in water.
9. Ensure that splashes on floor cleaned out without delay.
10. Ensure that washing of surface avoided for 3 to 4 weeks after completion.

10.14 Painting with Synthetic Enamel Paint

1. Ensure that preparation of surface has been carried out as per Specifications.
2. Ensure that undercoat allowed drying overnight and rubbed next day with first grade of wet abrasive paper to ensure a smooth surface.
3. Ensure that undercoat is of ordinary paint of shade to match the top coat as recommended by the same manufacture.
4. Ensure that Synthetic Enamel Paint conforming to IS 2932 and is of approved brand, manufacture and colour.

10.15 Floor Painting (CC surface/ CC block)

1. Ensure that Paint is of approved brand, manufacture and shade.
2. Ensure that floor surface is cleaned of all dirt, grease etc with cracks and holes filled with specified filler.
3. Ensure that if painting is to be done on Concrete surface, whether it is atleast 2 years old.
4. Ensure that a minimum gap of 24 hours is allowed between successive coats and painted surface brought into use only after a week after final coat.

11 PAINTING VARNISHING AND ALLIED FINISHES

11.1 Varnishing

1. Ensure that Varnish conforms to IS 347 and supply is from approved manufacturer.
2. Ensure that the numbers of coats are being applied as stipulated in the description of item.
3. Ensure that the surface planed smooth with knots, cracks etc filled with wood putty made out of wood powder and glue rubbed down perfectly smooth with sand paper and wiped with clean cloth.
4. Ensure that the undercoat is of a flatting varnish, cut and rubbed down to a smooth surface.
5. Ensure that the top coat is with stipulated brand of finishing varnish with the finished surface free from brush marks.
6. Ensure that varnishing done using fine haired brushes and not the ordinary paint brushes.

11.2 Oiling with Linseed Oil

1. Ensure that linseed oil conforms to IS 75 and is of approved brand and manufacturer.
2. Ensure that oil is clear, free from adulterants, sediments, suspended and other foreign matter.
3. Ensure that oil is being applied freely with brushes (no rags) and spreading evenly and smooth until no more oil is absorbed.
4. Ensure that oil applied using brushes with a minimum gap of 24 hours between successive coats and finished surface presents uniform appearance.
5. Ensure that work after completion is not looking patchy and sticky to touch.

11.3 Bees Waxing or polishing with readymade wax polish

1. Ensure that new surface planed smooth with knots, cracks etc filled with wood putty made out of saw dust of the type of wood treated and Bees wax rubbed down perfectly smooth with sand paper and wiped with clean cloth.
2. Ensure that pure bees wax free from paraffin or stearine adulterants is being used.
3. Ensure that polish applied evenly with a clean soft pad of cotton cloth on the surface and rubbed for half an hour till surface is dry and for second coat etc, the rubbing is done for one hour.
4. Final coat shall then be applied and rubbed for two hours (more if necessary) until the surface has assumed a uniform gloss and is dry, showing no sign of stickiness.

11.4 Lettering with Paint

1. Ensure that paint used is black Japan paint conforming to IS 341 or ready mixed paint of approved shade, Brand and Manufacture.
2. Ensure that the letters and figures are to the height and width stipulated with thickness of letters and vertical / slat as approved the Engineer.

12 DAMP-PROOFING AND WATERPROOFING

1. Ensure that damp proofing and waterproofing shall be taken up only when the sub-soil water level is at its lowest, that is, in the dry season.
2. Ensure that sufficient working space shall always be provided for external damp-proofing on new buildings which shall in no case be less than 600 mm suitably protected all-round the basement.
3. Dewatering shall be continued during the laying of the layers of damp-proofing materials until they have hardened and the surface has developed enough strength to resist full hydrostatic pressure.

12.1 Damp Proof Treatment above ground level

a. Damp Proofing of walls

1. Ensure that the mortar bed on which the Damp proofing treatment is to be laid has been levelled and made free from projection liable to cause damage to the Damp Proofing treatment.
2. Ensure that the treatment covers full thickness of wall and not be set back from wall face for pointing.
3. Ensure that the DPC is continuous with the floor. DPC shall not be carried across doorways, verandah arches and similar openings.

4. To arrest the passage of moisture between the flooring and the masonry, the faces of walls, pillars etc coming into contact with the flooring on the inside will be painted with hot Tar or Bitumen.

i) Cement Concrete

1. Ensure that CC of 1:2:4 mix with coarse aggregate of size 6mm to 20mm and of thickness 4 cm is being provided unless otherwise directed by the Engineer. Where an approved Water Proofing compound to IS 2645-1975 is specified, it shall be done in accordance with the directions of the Manufacturer.

2. Ensure that the top of the DP Course is criss cross and made rough for receiving the course of masonry over it.

3. Ensure that concrete is being cured for not less than 7 days where no water proofing compound is used.

4. Ensure that properly dried concrete surface is being cleaned with brushes and thereafter rubbed with cloth soaked in kerosene oil for priming.

5. Ensure that Hot Tar or Bitumen is being applied uniformly all over in two separate coats. Each coat is being closely followed by sprinkling of dry sand over it while still hot.

6. Ensure that Coal Tar is not being mixed with oxidised bitumen.

12.2 Damp Proofing of Floor

Where horizontal damp proofing treatment has to be carried over to a vertical face a Cement Mortar 1:4 Fillet 75mm in radius shall be provided at the junction with both horizontal and vertical surfaces finished smooth.

i) Treatment with Bitumen Felt

1. Ensure that the Bitumen felt conforms to the requirements of IS 1322-1993 and IS 7193-1974.
2. Ensure that Bitumen Primer conforms to IS 3384-1986.
4. Ensure that the surface on which the DPC is being laid first sprayed with Bitumen Primer @ 0.4 litre / m² over it and following will be applied.
   - Hot applied Blown Bitumen at the rate of 1.50 kg/ m²
   - Hessian Base self-finished Felt Type 3, Grade 2 or Glass fibre base Type 2, Grade II (as specified) and
   - Hot applied Blown Bitumen at the rate of 1.50 kg/ m²

12.3 Water Proofing of Roof

a) Water Proofing with Cement Slurry mixed with Fibre Glass Cloth consisting of applying:
   1. Ensure that surface preparation is as per Specifications.
   2. Ensure that water proofing treatment is carried out as per specification mentioned by manufacturer.
   3. Ensure that the entire treatment is taken upto 30 cm on parapet wall and tucked into groove in parapet all around.
   4. Ensure that final layer of brick tiling is being carried out with cement mortar.

b) Integral cement based water proofing treatment:
   1. Ensure that surface has been cleaned before treatment.
   2. Ensure that slurry coat of neat cement using 2.75 kg/sqm of cement admixed with proprietary water proofing compound conforming to IS 2645 is being applying and grouted over the RCC slab.
   3. Ensure that 20mm thick layer of cement mortar of mix 1:5 (1 cement : 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 is being laid to required slope and treating similarly the adjoining walls upto 300mm height including rounding of junctions of walls and slabs.
4. Ensure that cement concrete using broken bricks / brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS 2645 is being laid.

5. Ensure that after two days of proper curing, second coat of cement slurry admixed with proprietary water proofing compound conforming to IS 2645 is being applied.

6. Ensure that surface is being finished with 20mm thick joint less cement mortar of mix 1:4 (1 cement: 4 coarse sand) admixed with proprietary water proofing compound conforming to IS 2645.

7. Ensure that the surface is final finished with trowel with neat cement slurry and making of 300 x 300mm square.

8. Ensure that whole terrace so finished has been flooded with water for a minimum period of two weeks for curing and for final test.

13 WATERSUPPLY AND DRAINAGE

13.1 Water supply

1. Ensure that proper arrangements exist to isolate drinking water supply lines from impure water lines.

2. Ensure that alignment of water pipe so arranged that it is not affected by exposure to contaminating/deteriorating agent like sewage, drain water etc.

3. Ensure that where the water pipe has to pass through foul soil, whether the pipe protected by an exterior CI pipe or other means.

4. Ensure that workmanship of pipe line work is such as to be fully water tight.

5. Ensure that change in diameter / direction is gradual.

6. Ensure that underground pipes deep enough for protection from frost, traffic loads and vibrations.

7. Ensure that pipe passing through a wall or floor protected by a sleeve to allow free movement.
8. Ensure that water closet/ urinals / hot water systems get the supply only from feed cisterns and not directly from service pipe.

**A) Materials**

1. Ensure that all cast fittings are sound and free from laps, blow holes and pitting and with internal and external surfaces clean, smooth and free from sand etc.
2. Ensure that chromium plating specified, whether it is of thickness 0.3 microns conforming to IS 4827 as confirmed by manufacture’s test certificate.
3. Ensure that Brass Ball Valve made from Brass or Gun metal marked with IS 1703.
4. Ensure that Polyethylene float valve marked with IS 9762 or of approved make.
5. Ensure that Bib cock and stop cock screwed down type marked with IS 781 or of approved make.
6. Ensure that ferrule for connection with CI main is of nonferrous material, conforming to IS 2692.
7. Ensure that Fire Hydrants is of spindle type with 65mm outlet combined with sluice valve, marked with IS 909.
8. Ensure that Full way Valve is of brass fitted with a CI wheel and gate valve type marked with IS 780.
10. Pig Lead: Ensure that it conform to IS 782 for Caulking lead.
11. Lead Wool: Ensure that it conforms to IS 782 and is of fine standards or of plated ribbons. Whether rope of lead wool supplied for minimum length of 2 meters.
12. Non-return or check Valve – Brass or Gunmetal: Ensure that Brass or gunmetal of quality approved by the Engineer and provided on the ascending part of main and gunmetal valve confirm IS 778.
13. Asbestos Cement Pressure pipes- Ensure that pipes marked with IS 1592, the variation of internal dia is not more than 10% of nominal dia.
14. Cast Iron Centrifugally (Spun) pipes- Ensure that pipes are marked with IS 1536 and Specials conform to IS 1538 and of approved make.
15. Galvanized Iron pipes- Ensure that pipes are marked with IS 1239 Part I medium grade and fittings are of mild steel tubes or wrought steel,
16. Plastic Pipes- Ensure that pipes are marked with IS 4985 or approval make and fittings are of same make as PVC pipes injection moulded or made in Cast Iron.
17. Shower Rose Brass- Ensure that Chromium plated brass with uniform perforations and approved make.
18. Sluice Valves – Brass / Gun metal – Ensure that the Valve marked with IS 780 (for dia. up to and including 300mm size) and to IS 2906 (for dia above 300mm).

B) Laying and Joining of pipes and fittings –

1. Ensure that the bed of Trench is of soft or made up earth, whether well watered and rammed in 20 cm layer.
2. Ensure that if bed is rocky, whether excavated at least 150mm below trench grade and brought to grade by filling with selected earth or sand well compacted.
3. Ensure that Spigot and Socket pipe, whether hollows cut to receive the sockets of pipe with sufficient space left for joining and filled with sand after joining.
4. Ensure that pipes laid on level ground with socket facing the direction of flow of water (water enters pipe through socketed end leaves through spigot end).
5. Ensure that the pipes laid in clayey soil provided with an envelope of a minimum 100mm of tamped sand around the pipe to arrest bonding with clayey soil.
6. Ensure that thrust blocks provided wherever there is a change in direction / size of pipe line or where the pipe ends in a dead end.
7. Ensure that pipe is laid on slope steeper than $30^\circ$, whether one out of every three pipe lengths is fastened to vertical supports anchored in concrete.
C) Laying and Joining of A.C. Pressure Pipe (External Works) –

1. Ensure that pipes kept in stocks not exceeding 1.50 meter height and CI fittings kept under cover separately.
2. Ensure that Rubber rings kept clean, away from grease, oil, heat and light.
3. Ensure that trench width provides minimum clearance of 300mm on either side of pipe and have a minimum cover of 750mm when laid under footpaths and sidewalks, 900mm under roads with light traffic or under cultivated soil and 1250mm under roads with heavy traffic.
4. Ensure that pipes are laid in soil with poor bearing capacity and under heavy traffic, whether pipes laid on a concrete cradle.
5. Ensure that CI and AC Pressure Pipes are to be jointed, whether adapter used.
6. Ensure that all CI fittings are plain ended to suit the class and dia of pipe.
7. Ensure that anchorage at pipe ends or specials ends are of concrete cast in situ or masonry in cement mortar and extended to the film soil of the trench side and carried over the special to about 15 cms.
8. Ensure that test pressure kept as 1.50 times the actual operating pressure subjected to the stipulated maximum pressure for each class of pipe.

D) Laying and Joining of CI Pipes and Fittings (External Works) –

1. Ensure that depth of trench is not less than 1 metre measured from top of pipe to surface of ground when laid under roads and not less than 0.75m elsewhere.
2. Ensure that the pipes are to be laid involving a deviation of less than 11.25 degrees in plan or elevation, whether straight pipes laid on a flat curve ensuring minimum thickness of lead at face of socket of 6mm or opening between Spigot and Socket of maximum 12mm and with a deviation of about 2.25 degree at each joint.
E) Laying and Joining of G.I. Pipes (External Works) –

1. Ensure that the width is 30 cm and depth 60 cm for pipes 15 to 50mm and width 45 cm and depth 75 cm for pipes 45 to 100mm dia and in rocky area, whether minimum sand cushion of 7.5 cm is available below the pipe.
2. Ensure that ends of pipes threaded carefully to conform to IS 554.

13.2 Drainage

13.2.1 General Requirements

1. Ensure that the gradient of sewer falls within the range as per specifications.
2. Ensure that size and slopes provided conform to local Municipal Bye Laws after obtaining the sanction of the competent authority.
3. Ensure that the water seal of floor traps are adequate.
4. Ensure that the piping installations are easily accessible for maintenance.
5. Ensure that the pipe line has been checked under required pressure before covering.
6. Ensure that Socket end of pipe is against the direction of flow in case of Spigot and Socket type pipe.
7. Ensure that mortar joints have been provided properly and cured for 7 days.
8. Ensure that adequate cushion is available for pipes crossing the roads.
9. Ensure that pipes are lifted and lowered and not slid into trenches.
10. Ensure that the sewer line is not laid above water line.

13.2.2 Materials

A. Flushing Tank

1. Ensure that C.I. Cover is of dia. 560mm, medium duty or heavy duty conforming respectively to IS 1726 Pt. IV and IS 1726 Pt. II.
2. Ensure that the syphon is of automatic type made of Cast Iron with trapped outlet for flushing and of dia. 65mm or 80mm or 100mm as specified.
B. Manholes

1. Ensure that C.I. Covers are of Heavy Duty conforming to IS 1726 Pt. I or Medium duty to IS 1726 Pt. IV & V or Light duty IS 1726 Pt. VI & VII with a raised chequered design on top surface.
2. Ensure that weight of manhole covers and frames conform to IS 1726.
3. Ensure that CI Manhole covers bear the word “Sewer” or “Storm” embossed on top.
4. Ensure that Precast Concrete Manhole cover conforms to IS 12592 (Pts 1&2) as per Manufacturer’s Test Certificates.
5. Ensure that salient dimensions of Precast Concrete Manhole Cover are as stipulated as per specifications with minimum clearance at top between the frame and cover of 5mm.
6. Ensure that Lifting device of Precast Concrete manhole cover is M.S. rod of dia 10mm for LD, 12mm for MD and 16mm for HD & EHD and protected by galvanizing or epoxy coating etc.
7. Ensure that underside of Precast Concrete manhole cover treated with anticorrosive paint and top surface given a chequered finish.
8. Ensure that edges of the Precast Concrete manhole cover protected by mild steel sheet of minimum thickness 2.5mm with exposed surface of sheet treated with anti corrosive paint.

C. Cement Concrete Pipes (With or without reinforcement)

1. Ensure that Pipes conform to the relevant class NP1, NP2, NP3, NP4, P1, P2 or P3 and marked with IS 458 or of approved make.
2. Ensure that specified Pipe used is suitable for the purpose, keeping in view details of Test Pressure and Conditions where normally used as stipulated as per specifications.
D. Road Gully Grating

1. Ensure that Horizontal CI Grating and Frame conform to heavy duty (IS 1726 Pt. II) or Medium duty (IS 1726 Pt. IV & V) of Light duty (IS 1726 Pt. VI & VII) with a raised chequered design on the top surface and of weight specified in IS 1726.
2. Ensure that the Gully grating cover hinged to the frame to facilitate the opening.
4. Ensure that vertical gully grating is of 12mm round bars fixed in CC Block at bottom and welded or riveted to 40 × 6mm flat at the top.

E. Stoneware Pipes and Fittings

1. Ensure that the pipes and fittings with Spigot and Socket ends marked with IS 651.
2. Ensure that the thickness of barrel and Socket is as stipulated as per specifications for different dia of pipes.

F. Stone Ware Gully Trap

1. Ensure that Stone Ware Gully Trap are marked with IS 651 or of approved make.
2. Ensure that Stone Ware Gully Trap provided with CI square grating of suitable size and water tight CI cover of size 300mm × 300mm and of weight 4.5 Kg and 2.7 Kg respectively.

13.2.3 Constructing Flushing Tank

1. Ensure that Flushing Tanks constructed at suitable points/ intervals to ensure self cleansing velocity of not less than 75 cm / second.
2. Ensure that capacity of flushing tank adequate to provide water per flush of quantity as stipulated as per specification for different dia of pipes.
13.2.4 Constructing Man-Hole – General Design Features

1. Ensure that manhole or inspection chambers provided at every change of alignment, gradient or dia of drain.
2. Ensure that manholes are situated at maximum distance apart of 30m.
3. Ensure that where the dia of drain is increased, whether crown of pipes fixed at same level and slope given in the invert of manholes chamber and if not possible whether crown of branch Sewer fixed at a lower level but with peak flow level of two sewers remaining the same.
4. Ensure that where two sewers of unequal sectional area meet, whether invert of smaller sewer kept atleast 2/3 the dia of main sewer, above the invert of the main sewer.
5. Ensure that branch sewer delivers sewage in the manhole in the direction of main flow.
6. Ensure that sizes of manholes, depending on locations and depths are as stipulated as per specifications and are as per Municipal Bye Laws.
7. Ensure that manholes are provided in foot paths / roads with vehicular traffic, whether provided with medium duty / heavy duty cover respectively.
8. Ensure that MS foot rests provided in all Manholes deeper than 0.8 metre.

13.2.5 Laying and Jointing Cement Concrete Pipes and Specials

A. Trenching
   Ensure that where the pipe is to be laid directly on soil, whether the bed suitably rounded to fit the lower part of pipe.

B. Laying

1. Ensure that pipes unloaded and handled with care to avoid damages and broken or defective pipes and specials discarded.
2. Ensure that laying of pipes proceeds upgrade of the slope and socket ends face upstream in case of Spigot and Socket pipes.
3. In case of pipes with Collar joints, whether collars slipped on before laying of next pipe.

4. Ensure that where foundation conditions are unusual, whether pipe encased around in 15 cm thick CC 1:5:10 or in compacted sand or gravel.

5. Ensure that where natural foundation is inadequate, whether pipes laid on Concrete Cradle supported on proper foundation with depth of concrete below bottom of pipe of at least 1/4 the internal dia of pipe subject to minimum of 10 cms and maximum of 30 cms an width extending on sides of the pipe for at least 1/4 the of outside dia in case of pipe 300mm and more in dia. Whether pipe laid before concrete has set.

6. Ensure that bedded in natural soil in trench, whether bedding is even and firm.

7. Ensure that pipes are laid completely above the ground, whether the foundations made even and well compacted to support the pipe or pipe supported as rigid foundations at intervals with space between the supports not exceeding the length of pipes and supports situated as near the joints as possible.

C. Jointing

1. Ensure that where joints are of type rigid spigot and socket or rigid collar or semi-flexible spigot and socket or semi flexible collar or internal flush or external flush whether executed respectively as per specifications.

2. In case of laying of pressure pipe lines with jacking of pipes, whether procedure outlined as specification adhered to during execution.

D. Refilling of Trenches

1. Ensure that pipes are not bedded on concrete, whether precautions taken to prevent displacement and settlement of the pipes.

2. Ensure that back fill material packed around the pipe by hand and rammed with a shovel or light tamper upto the level of top of pipe.
3. Ensure that refilling done evenly upto 60cm above top of pipe with no tamping done within 15cm of top of pipe and tamping becoming heavier as depth of back till increases.

13.2.6 Laying and Jointing Stoneware Pipes

A) Trenching

1. Ensure that trench provides for a minimum cover of 90 cm over the pipe when it is laid under a road way.
2. Ensure that width is dia. of pipe plus 30 cm for trench of average depth 120 cms and dia. of pipe plus 40 cms for trench of depth more than 120 cms, all with a minimum width of 75 cms for depth exceeding 90 cms.

B) Laying

1. Ensure that laid on a bed of cement or lime concrete of thickness as specified, projecting on each side to width as specified.
2. Ensure that pipes are laid in shallow depth crown of pipe at 1.20m or below from ground, whether covered with 15 cm concrete above crown of pipes and sloped off to give a minimum thickness of 15 cm concrete around.
3. Ensure that pipe is laid at a depth greater than 1.20 m at crown, whether concreted at the sides upto the level of centre of pipe and sloped off from the edges to meet the pipes tangentially.
4. Ensure that pipes laid with, socket up the gradient and in straight alignment between the manholes.
5. Ensure that the pipes rest evenly on bed concrete with hollows excavated to receive the sockets of the pipe.
6. In case where pipe rests on soil instead of on concrete bed as in cases of storm water drains, whether bed made up of firm and undisturbed ground.
7. In cases of trench in very hard strata, whether pipe laid on a leveling coarse of concrete over hard ground.
C) Jointing

Ensure that jointing done adopting the process described in specifications.

D) Testing of Joints

Ensure that when used for sewers, whether tested at a pressure of 2.5m head of water at the highest point of the section under test and joints found leak proof.

E) Refilling of Trenches

Ensure that stipulations are as para 14.2.5 D above.

13.2.7 Fixing Stoneware Gully Trap

A) Fixing

Ensure that S.W. Gully Trap fixed on CC foundation of Concrete 1:5:10, 65cm square and minimum 10 cm thickness.

B) Brick Masonry Chamber

1. Ensure that brick masonry chamber constructed as per drawing.
2. Ensure that CI cover with frame 300 x 300 mm (inside) fixed on top of masonry chamber with CC 1:2:4, with finished top of cover about 4 cms above the adjoining ground level.

13.2.8 Constructing of Open Surface Drain

Ensure that constructed as per drawing with average depth of 20 cm for drain size 10 cm & 15 cm and 30 cm for drain size 25 cm and prescribed bed slope.

13.2.9 Constructing Road Gully Chamber with Grating

A) Road Gully Chamber with Horizontal grating
Ensure that RCC Gully grating fixed in cement mortar 1:2 and CI grating fixed in CC 1:2:4.

B) Road Gully Chamber with Vertical grating

Ensure that 12mm round vertical bars of grating fixed in CC block at bottom and welded or riveted at top with MS flat 40 x 6mm.

13.2.10 Constructing of Septic Tank

A) General precautions

1. Ensure that surface and sub soil water excluded from finding way into the septic tank.
2. Ensure that proper arrangement made for disposal of the effluent from the septic tank.

B) Construction

1. Ensure that provided with a CI cover and frame of adequate strength and of minimum dia of 600mm for medium density and minimum 610mm x 450mm for low density type of specifications.
2. Ensure that provided with a ventilating pipe of minimum dia 50mm with a suitable cage of mosquito proof wire mesh and extended to a height which would cause no smell nuisance.

13.2.11 Soak Pit 2.5M dia x 3M Deep / 1.2 x 1.2x 1.2M

Ensure that open surface drain connected to the soak pit through 100mm dia S.W. pipe with open joints.

13.2.12 Dispersion Trench

1. Ensure that the site selected is free from fibrous roots of trees or vegetation likely to penetrate the trench and cause blockage.
2. Ensure that the dispersion trench and slope constructed as shown in the drawing and finished top surface kept at least 15 cm above ground level.

14. References

2. Check list of Specifications for Civil Engineering Works for Quality Control, August, 2008 issued by RITES Ltd.
4. Indian Practical Civil Engineering Handbook – P.N. Khanna

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